CLAIMS

1. An optical transmission system in which an optical signal is transmitted from an optical transmitter to an optical receiver and outputted in a form of an output electrical signal after a noise canceling process is performed, the noise canceling process canceling out noise components which occur during the transmission, wherein

the optical receiver and the optical transmitter are connected to each other by one optical fiber, through which an optical signal is transmitted before being intensity-modulated,

the optical receiver includes:

a first processing unit operable to receive an optical signal, intensity-modulate the received optical signal, and split the intensity-modulated optical signal into two optical signals of which respective intensity-modulated components are in antiphase;

first and second optical transmission fibers which transmit the two optical signals respectively; and

a second processing unit operable to convert the two optical signals into electrical signals respectively, and generate an output electrical signal by performing differential amplification on the electrical signals.

2. The optical transmission system of Claim 1, wherein

the optical transmitter includes an output processing unit operable to receive an electrical signal, convert the electrical

signal into an optical signal, and transmit the optical signal to the optical receiver via the optical fiber.

3. The optical transmission system of Claim 2, wherein the first processing unit includes:

an intensity modulation subunit operable to receive an optical signal via the optical fiber, intensity-modulate the received optical signal based on a modulated electrical signal having a certain frequency, and thereby generate a modulated optical signal; and

an optical separation subunit operable to generate, from the modulated optical signal, a first output optical signal and a second output optical signal of which respective intensity-modulated components are in antiphase, and output the first and second output optical signals to the first and second optical fibers respectively, and

the second processing unit includes:

an optical/electrical conversion subunit operable to convert the first and second output optical signals into first and second electrical signals respectively; and

a differential amplification subunit operable to invert a phase of the second electrical signal, add the phase-inverted second electrical signal to the first electrical signal, and thereby generate the output electrical signal.

4. The optical transmission system of Claim 3, wherein

the first processing unit consists of a Mach-Zehnder type external modulator, and

the second processing unit consists of a balanced optical/electrical converter.

5. The optical transmission system of Claim 3, wherein

the electrical signal which the output processing unit receives is an intermediate frequency signal having a frequency which is different from a frequency of a radio frequency signal,

the modulated electrical signal is a local oscillator signal,

the intensity modulation subunit intensity-modulates the received optical signal based on a frequency of the local oscillator signal, and thereby generates the modulated optical signal of which intensity-modulated components have a frequency of the radio frequency signal,

the optical/electrical conversion subunit converts the first and second output optical signals into the first and second electrical signals respectively, the first and second electrical signals having the frequency of the radio frequency signal, and

the differential amplification subunit inverts the phase of the second electrical signal, adds the phase-inverted second electrical signal to the first electrical signal, and thereby generates the radio frequency signal.

6. The optical transmission system of Claim 2, wherein

the output processing unit includes:

a generation subunit operable to receive an electrical signal, convert the received electrical signal into an optical signal, and output the optical signal to a third optical

transmission fiber; and

a polarization scrambler operable to receive the optical signal via the third optical transmission fiber, change a polarization type of the optical signal randomly, and output the optical signal to the optical receiver via the optical fiber.

7. The optical transmission system of Claim 6, wherein

the first processing unit receives an optical signal of which a polarization type changes randomly from the optical transmitter via the optical fiber.

8. The optical transmission system of Claim 1, wherein

the optical receiver further includes:

a polarization control unit operable to receive an optical signal from the optical transmitter via the optical fiber, and control a polarization of the optical signal so that the type of the polarization of the optical signal becomes the same as a type of a polarization which the first processing unit accepts, wherein

the first processing unit receives the optical signal of which the polarization is controlled by the polarization control unit.

9. The optical transmission system of Claim 8, wherein

the polarization of the optical signal received by the polarization control unit includes first polarization and second polarization,

the polarization which the first processing unit accepts

is the first polarization,

the polarization control unit includes:

a separation subunit operable to split the optical signal into a first polarized signal having the first polarization and a second polarized signal having the second polarization;

a rotation subunit operable to rotate the second polarization of the second polarized signal so as to change the second polarization to the first polarization, and thereby generate a third polarized signal having the first polarization; and

a combining subunit operable to combine the first polarized signal with the third polarized signal, and thereby generate a combined optical signal having only the first polarization, and

the optical signal of which the polarization is controlled by the polarization control unit is the combined optical signal.

10. The optical transmission system of Claim 1

the optical transmitter includes:

an output processing unit operable to receive an electrical signal, convert the electrical signal into an optical transmission signal, and output the optical transmission signal to a third optical transmission fiber,

a conversion processing unit operable to convert a modulated electrical signal having a certain frequency into a modulated optical signal, and output the modulated optical signal to a fourth optical transmission fiber, and

a multiplexing unit operable to receive the optical

transmission signal via the third optical transmission fiber and the modulated optical signal via the fourth optical transmission fiber respectively, multiplex the optical transmission signal with the modulated optical signal, thereby generate multiplexed optical signal, and output the generated multiplexed optical signal to the optical receiver.

11. The optical transmission system of Claim 10, wherein the optical receiver further includes:

an optical separation subunit operable to receive the multiplexed optical signal from the optical transmitter via the optical fiber, split the multiplexed optical signal into the optical transmission signal and the modulated optical signal, and output the optical transmission signal and the modulated optical signal to the first processing unit and a fifth optical transmission fiber respectively; and

a first optical/electrical conversion subunit operable to receive the modulated optical signal via the fifth optical transmission fiber, convert the modulated optical signal into a modulated electrical signal, and output the modulated electrical signal to the first processing unit,

the optical signal received by the first processing unit is the optical transmission signal,

the first processing unit includes:

an intensity modulation subunit operable to intensity-modulate the received optical transmission signal based on a frequency of the modulated electrical signal, and thereby generate a modulated optical signal;

an optical separation subunit operable to generate, from the modulated optical signal, a first output optical signal and a second output optical signal of which respective intensity-modulated components are in antiphase, and output the first and second output optical signals to the first and the second optical fibers respectively, and

the second processing unit includes:

a second optical/electrical conversion subunit operable to convert the first and second output optical signals into first and second electrical signals respectively; and

a differential amplification subunit operable to invert a phase of the second electrical signal, add the phase-inverted second electrical signal to the first electrical signal, and thereby generate the output electrical signal.

12. The optical transmission system of Claim 11, wherein

the electrical signal which the output processing unit receives is an intermediate frequency signal having a frequency which is different from a frequency of a radio frequency signal,

the modulated electrical signal is a local oscillator signal,

the intensity modulation subunit intensity-modulates the received optical transmission signal based on a frequency of the local oscillator signal so as to generate the modulated optical signal of which intensity-modulated components have a frequency of the radio frequency signal,

the second optical/electrical conversion subunit converts the first and second output optical signals into the

first and second electrical signals respectively, the first and second electrical signals having the frequency of the radio frequency signal, and

the differential amplification subunit inverts the phase of the second electrical signal, and adds the phase-inverted second electrical signal to the first electrical signal so as to generate the radio frequency signal.